

PROPOSED METHODS TO CAPTURE AND RADIO-TAG THE CRITICALLY ENDANGERED JERDON'S COURSER IN ANDHRA PRADESH, INDIA

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Abstract

The Jerdon's Courser *Rhinoptilus bitorquatus* is a nocturnally active cursorial bird. The species is known to occur only from a small area of scrub jungle in and around Sri Lankamaleswara Wildlife Sanctuary, Cuddapah district, Andhra Pradesh, India, and is listed as Critically Endangered by the IUCN. Very little information is available on the distribution, ecology, population size, and habitat requirements of the species. Hence, for effective conservation of this critically endangered bird species, there is an urgent need to carry out radio-telemetry studies to understand its ecological requirements. We propose methods to capture and radio-tag the Jerdon's Courser on the basis of field trials. We attempted to capture the bird by following the night search-dazzling and noose trap methods. The Jerdon's Courser was not captured during the field trials. However, we found that both the methods can be followed to capture this bird, provided that the presence of the bird is established by photo-trapping and other diagnostic methods. On the basis of trials we conducted on Red-wattled Lapwings, we suggest that fixing a back-mounted tag using glue will be ideal for radio-tracking the Jerdon's Courser. We discuss the implications of our results and the importance of radio telemetry studies for conservation of the Jerdon's Courser.

Key words

Jerdon's Courser, *Rhinoptilus bitorquatus*, Bird-trapping techniques, Radio telemetry

Introduction

The Jerdon's Courser *Rhinoptilus bitorquatus* is a nocturnal cursorial bird and one of the world's rarest birds, found only in Andhra Pradesh, India. The Jerdon's Courser was believed to be extinct because none was recorded after 1900 until the species was rediscovered in 1986 near Reddipalli village, in Cuddapah district of Andhra Pradesh, India (Bhushan 1986). The area where it was rediscovered was designated as the Sri Lankamaleswara Wildlife Sanctuary (14°45'22" N and 79°07'22" E to 78°02'22" E).

Prior to 2000, records of the Jerdon's Courser were mainly from sightings during night time walks in and around the place where it was rediscovered. In 2001, a new method was developed for detecting the presence of Jerdon's Coursers by deploying tracking strips upon which the birds leave their distinctive footprints, which differ from those of other bird species present in the area. This was established by setting up automatic cameras triggered by birds interrupting an infrared beam oriented horizontally and close to the ground. This allowed the identity of birds which left a particular set of tracks to be identified (Jeganathan *et al.*, 2002). Surveys using this method have detected the species in three new places (Jeganathan *et al.*, 2004), but the habitat in one of these places was subsequently destroyed during the construction of the Telugu-Ganga canal (Jeganathan *et al.*, 2008).

The call of the Jerdon's Courser was not known until it was recorded and identified in September 2002 (Jeganathan and Wotton 2004). The identity of the species making the call was established by watching an individual call. At the same time, the call was recorded on tape. A tape transect survey method was devised to find the Jerdon's Courser in new areas, and a survey conducted using this method resulted in responses being elicited from three new places in and around the sanctuary (Jeganathan *et al.*, 2008).

A study of the Jerdon's Courser area using tracking strips has identified the preferred habitat to be scrub jungle with open areas where the density of large bushes (> 2 m tall) is in the range 300–700 ha⁻¹ and the density of small bushes (< 2 m tall) is less than 1000 ha⁻¹ (Jeganathan *et al.*, 2004).

Nine specific threats were identified, with the major threat to the survival of this species being the loss and degradation of scrub forest (Senapathi *et al.*, 2007, Jeganathan *et al.*, 2008). Since the known population and range of the Jerdon's Courser are small and declining, it is categorized as Critically Endangered in the IUCN Red List (IUCN 2010). Very little information is available on the distribution, ecology, population size, and habitat requirements of the species (Birdlife International 2001).

Methods assessed to capture the Jerdon's Courser

Two methods were assessed to capture the Jerdon's Courser, namely noose trapping and night search-and-dazzling. Attempts were made to capture the Jerdon's Courser mainly in and around the area where it was regularly seen or heard and footprints or photographs obtained previously in Sri Lankamaleswara Wildlife Sanctuary. Prior to employing these methods to capture the bird, attempts were made to ascertain its presence mainly through tracking strip surveys, camera trapping, and listening for calls. This study was carried out from 2005 to 2006.

Noose trap

Several species of long-legged waders are caught mostly with nooses (Balachandran 2002). Depending on the target species and terrain, the size of the noose and the length of the peg which holds the noose are varied. We have developed a noose trap design which is suitable for the scrub jungle habitat and for capturing nocturnal cursorial birds inhabiting such habitats.

Trap design

An array of nine plastic meshes of height 1 m and length 35 m were arranged on the ground in a zig-zag manner (Fig 1). Thin bamboo sticks of the same height were inserted within the mesh at regular intervals. Jute strings tied on top of these bamboo sticks were pulled on either side of the standing mesh and tied to a nail (15 cm) pegged in the ground. This enabled the mesh to stand in a vertical position and act as a fence or barrier to any bird moving on the ground within that area.

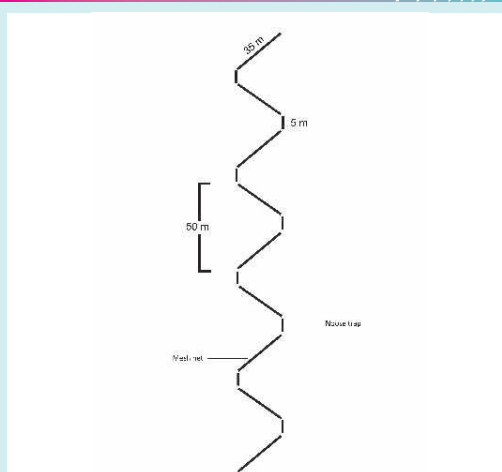
A 5 m gap was provided between any two fences in the zig-zag design. The gap was for setting up nooses. This type of zig-zag arrangement with fences as barriers and with narrow spaces for movement between fences was essentially to habituate the birds to move through the entrances created. Later, noose traps were set along the path to capture the birds. This design with nine fences allowed us to set four noose traps on both side, at a distance of c. 50 m between trap locations.

Noose design

A noose made of nylon twine was fitted on a 10 cm long wooden peg. The diameter of the noose was approximately 8-10 cm. A small loop of strong thread was fixed (Fig 2) at the middle of the wooden peg, mainly to connect the other nooses with a trip wire. In the 5 m gap between the two fences, 45 such nooses were arranged in a straight line, with a distance of about 10 cm between one noose peg and another. The pegs were placed in a slanting position on the ground (c. 70-80°) so that the nooses overlapped each other and no gap remained between any two nooses. Half of each noose peg was fixed underground, so that the noose touched the ground.

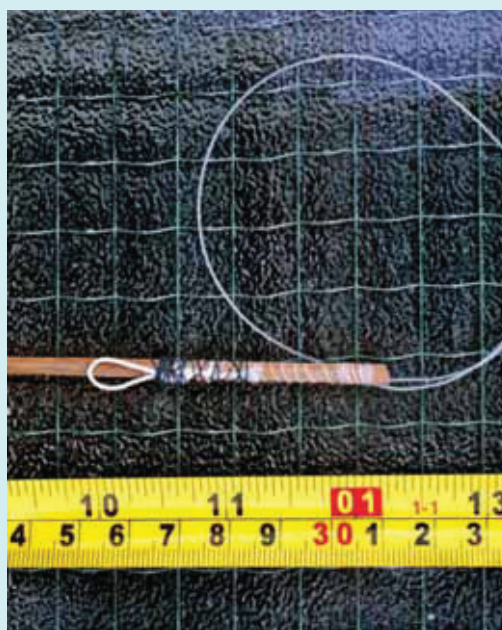
Since the surface of the ground was naturally hard, in the space provided for fixing the nooses, a strip of ground 5 m long and about 25 cm wide was cleared of stones and

Figure 1



Diagrammatic Representation of Noose Trap Design.

Figure 2



Shows the single noose with wooden peg and a small loop of thread fixed to connect other nooses by a trip wire.

grasses. The earth was loosened using a mattock and crowbar. Before fixing the nooses on the ground, water was sprinkled on the soil.

Bite indicator

The trip wire connecting all the nooses together was tied to a peg at one end, while the other end of the trip wire was connected to a bite indicator. The bite indicator was a radio transmitter attached to a 1 m long bamboo pole fixed near the fence in a slanting position. The tag was fitted with a microswitch to which the trip wire was fastened. This arrangement resulted in the radio tag producing a signal if the trip wire and connected nooses remained undisturbed. However, any disturbance of the nooses and trip wire, such as that caused by the capture of a bird, resulted in deactivation of the transmission pulse. The signals from all the eight traps were monitored every 5 minutes from a nearby location (c. 200 m away, on a watchtower) and thus if a bird was captured we could reach the trap quickly. The trap locations were stored in a GPS to relocate them in the field at night. Each group of nooses had a radio tag transmitting on a different frequency so that the correct group could be identified and reached quickly.

Operating the traps

Plastic mesh fences were arranged in an array with a narrow entrance to habituate the birds and to make them use a particular path before the noose traps were set up. The fences and traps were set in the places where the Jerdon's Coursers had been sighted or heard or where their tracks were obtained on the tracking strips. The fences were deployed in the evening and removed in the morning. On average, it took 2 hours for four persons to set up nine fences and eight noose traps.

Night search and dazdling

Conventionally, the Jerdon's Courser was sighted during night-time walks in lightly wooded scrub jungle, during which an observer scanned the ground with torchlight, while an electrical buzzer was used to mask the footfalls. We followed a similar approach in which the white noise to mask our footfall was provided in the form of a continuous loop cassette tape recording of a buzzer. This approach assumed that the birds would be surprised at fairly close distances (less than 10-15 m), making it possible to catch a bird by tossing a hand-net on the bird. The hand-net was made of a 3.5 m long thin bamboo pole and a funnel shaped net (45 cm rim diameter) attached at one end.

Dazdling was only undertaken in areas where the Jerdon's Courser had previously been recorded. No attempt was made to cover other apparently suitable areas. In addition to dazdling, regular listening at dusk was undertaken to note the locations where Jerdon's Coursers were heard calling. The length of time spent dazdling along with the number of species seen while dazdling was recorded. In addition, a GPS was used to record the routes that were searched. This was downloaded every night to obtain a detailed record of the areas searched. The aim of the search was to cover all areas within 25 m of the observer at all times. It was considered that any bird recorded farther than 25 m away was unlikely to be caught successfully. It is likely that the average distance scanned on either side of the observer was between 10 and 15 m, suggesting that a corridor of c. 25 m width was searched.

Searches were carried out from 26 November to 13 December 2006. Three nights were avoided, those of the 4, 5, and 6 December, as these coincided with the full moon, when the moon rose before sunset and fell after sunrise. All dazdling searches were undertaken only when the moon had fallen below the horizon (as predicted by charts available on the Internet at http://aa.usno.navy.mil/data/docs/RS_OneYear.html and later confirmed in the field). In practice, dazdling undertaken on nights leading up to the full moon were initiated at around 04.00 hrs and lasted until 05.30 hrs, while dazdling undertaken on nights following the full moon were initiated at around 19.00 hrs and completed by around 20.30 hrs.

Results

Noose trap

The trials with noose traps and fences were carried out for about two months (from 22 October 2005 to 18 December 2005). Noose traps were monitored for 128 trap-nights (8 noose traps for 16 nights). These traps were set up between 29 October 2005 and 23 November 2005. Single individuals of two bird species, the Tawny Pipit *Anthus campestris* and Red-wattled Lapwing *Vanellus indicus*, were captured during this period.

Night search and dazdling

Night search and dazdling took place on 25 occasions. The total amount of time spent dazdling was 32 hours 18 minutes, and the distance covered during dazdling was 60.4 km. No Jerdon's Courser was encountered during this time.

Eight species of birds were encountered, the Red-wattled Lapwing, Eurasian Stone Curlew *Burhinus oedicnemus*, Indian Nightjar *Caprimulgus asiaticus*, Savanna Nightjar *Caprimulgus affinis*, Grey Francolin *Francolinus pondicerianus*, Barred Buttonquail *Turnix suscitator*, Painted Sandgrouse *Pterocles indicus*, and Rufus-tailed Lark *Ammomanes phoenicurus*. Among these, the nightjars were the most common, followed by the Red-wattled Lapwing (the encounter rates were 0.413 and 0.116 per km, respectively). Four species of mammal were encountered. The most common of these was the Black-naped Hare *Lepus nigricollis* (Table 1). Much of the dazdling was undertaken in the core area of the Jerdon's Courser.

Table 1 : Encounter rates (sightings per km) of the species seen during the night search in and around Sri Lankamaleswara Wildlife Sanctuary from 26th November to 13th December 2006.

S.No.	Species encountered	No. of times sighted	Encounter rate (km)
1	Grey Francolin	1	0.017
2	Red -wattled Lapwing	7	0.116
3	Indian Stone Curlew	1	0.017
4	Indian Nightjar	8	0.132
5	Savanna Nightjar	1	0.017
6	Nightjar sp. (not including above)	16	0.265
7	Painted sandgrouse (pair)	1	0.017
8	Barred-Buttonquail (pair)	1	0.017
9	Rufus tailed Lark	1	0.017
10	Unidentified Passerines	2	0.033
11	Chinkara	1	0.017
12	Mongoose sp.	1	0.017
13	Civet or Mongoose	1	0.017
14	Black-naped Hare	21	0.348
15	Indian Gerbil	10	0.166
16	Indian Rock Python	1	0.017

Discussions

A previous estimate of the encounter rates during dazzling was 2 birds during 20 hours of search (Jeganathan *et al* 2004). In the present survey, over 30 hours of dazzling searches were undertaken in and around the best known locations for the Jerdon's Courser during November-December 2006. No individuals belonging to the species were recorded.

It is possible that the birds were temporarily not present in the area during the time of search. It is also possible that the birds had moved away to a different location due to the disturbances associated with nocturnal dazzling. Also, there is a chance that the birds are still present in the vicinity but not in the precise location of the dazzling sessions. However, the call of the Jerdon's Courser was not recorded during the call-listening sessions ($n=18$) held at nine different locations within the main Jerdon's Courser area for about 7 hours (average call-listening duration 23 minutes/session). The call-listening effort was small, but the calling of the Jerdon's Courser is also known to be intermittent and sometimes infrequent at sites where the species is known to occur. However, the duration of the night search was very long. It was highly likely that due to changes in the habitat structure and disturbances the birds had stopped using this region during the survey period.

Night search and dazzling is not a good method with which to determine the presence or absence of the Jerdon's Courser as the efficiency is likely to vary with habitat characteristics such as the density of bushes and the nature of ground vegetation, which makes the interpretation of negative results problematical (Jeganathan *et al.*, 2002). However, in case presence is confirmed through other standard methods such as tracking strips, listening to calls, and camera trapping in an area, night search and dazzling could be a potential method for capturing the Jerdon's Courser.

The Jerdon's Courser is difficult to spot as it is highly camouflaged in its surroundings; however, our observations suggests that once it is spotted in a torch beam it does not move or fly away unless approached very close. The bird generally freezes and crouches immediately on the ground as soon as a torch beam hits it. There were several instances (about 10 occasions) when the observer saw the bird at a very close distance (2 m to 10 m) (Jeganathan 2005, Jeganathan 2008). This skulking behavior should facilitate its capture. It should be noted that it was generally captured by this method by the local bird trappers (Bhushan 1986).

Although, the noose trap was not successful in capturing the Jerdon's Courser during our survey, its use is a potential method to use in capturing this species. It should be noted that the number of trap nights was very low to capture the Jerdon's Courser. However, the Red-wattled Lapwing, which has a body size similar to that of the Jerdon's Courser, was captured at night during this short trial, and so was the Tawny Pipit (captured during dawn), which is smaller than any cursorial bird of this region.

Apart from the noose trap method, small elastic-powered single pole clap nets triggered by a bird pecking at tethered live insect bait can be used to capture the Jerdon's Courser (Green *et al.*, 2000). However, much depends on developing a method to attract the Jerdon's Courser to the vicinity of the trap by finding a supply of suitable bait. Dung beetles (Scarabaeidae) associated with buffalo dung, found commonly in the study area, might be suitable insects.

Proposed method to radio-tag the Jerdon's Courser

Birds could be captured using the methods explained above, especially at sites where there have been regular records. After capture, back- or tail-mounted radio tags could be attached on the birds, and the birds could be ringed. From the biometric data given by Bhushan (1986), using a back-mounted tag which weighs c. 2.5g (<2% of body mass) and has a signal range of c. 0.5 m with a 16 week battery life should be ideal. These tags can be attached to the back of a bird back using cyanoacrylate glue (Green 1988). They are glued to the feathers and skin on top of the pelvis (synsacrum) after the area has been cleaned with acetone. The tag is attached to a rectangle of muslin cloth so that there is a margin of cloth about 5 mm wide around the tag. This cloth increases the surface area and allows the tag to be attached to the skin for longer. When used on other species in the UK (Stone Curlew *Burhinus oedipnemos*, Corncrake *Crex crex*, Common Snipe *Gallinago gallinago*), this method resulted in most tags remaining attached until the moult of the contour feathers began from the area to which the tag was glued. Trials on the Red-wattled Lapwings (3 birds) captured in the study area using this method showed that fixing the radio tags can be completed within 20 minutes from the time of capture, including the time spent on collecting morphometric measurements and fixing metal and colour rings.

Importance of radio-telemetry studies on Jerdon's Courser

Radio tracking will reveal information about the ranging behaviour, from which detailed maps of the movements of Jerdon's Coursers can be produced. Through radio tracking we can also gain knowledge about their feeding areas, roosting sites, and nest sites. Radio tracking will also help to develop more efficient survey methods. It will be possible to measure the proportion of occasions on which radio-tagged Jerdon's Coursers respond to tape recordings and to determine whether they only do so at certain times of the year. It is possible to estimate the number of individuals present in an area by measuring the ratio of untagged to tagged individuals responding to tape playbacks (Bibby *et al.*, 2000) as well as by camera trapping them. Since the number of tagged individuals is known, the total number of individuals present could be obtained using this ratio. It would also be possible to measure the proportion of occasions on which a radio-tagged Jerdon's Courser responds to tape playback by calling when it is within 250 m. This estimate of survey efficiency will be useful to convert the results of tape transects directly to density estimates. Hence, radio-tracking the Jerdon's Courser will help in assessing the population size as well as range. It is possible that individual Jerdon's Coursers occupy a home range within a known area for only some part of the year. Birds may move to other areas or habitats at different times of the year. This possibility can only be investigated by radio-tracking. Radio-tracking will reveal information about the Jerdon's Courser that could not be gained by any of the other survey techniques employed during this study. The information gained from radio-tracking will be of direct and immediate value for remedial management intervention.

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Plate 1



Jerdon's Courser Habitat

Plate 2



Jerdon's Courser